# Diseases of DOMESTIC RABBITS

Conservation Bulletin 31

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# DISEASES OF DOMESTIC RABBITS

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TO PREVENT or control rabbit diseases by effective sanitary practices is far more economical than to treat animals that become sick. Diligent application of the principles of disease prevention and of good animal-husbandry practices should provide rabbit producers a reasonable profit from investments. Sanitation and disease control cannot replace a practical knowledge of animal management, but prevention of losses will eliminate the most important hazards. The diseases of domestic rabbits are different from most of those observed in other kinds of farm stock, but the recommendations in this bulletin will enable producers to recognize and deal with them.

# DISEASES OF DOMESTIC RABBITS

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THE fact that few forms of stock raising allow for more than a small margin of profit makes it essential to keep preventable losses at the minimum. The factor of disease frequently determines whether the rabbit producer will make a success or failure of his enterprise. The health of his animals therefore must be given great consideration in his management practices.

## SANITATION

Sanitation has been well defined as the establishment of environmental conditions favorable to health. Since rabbits must have good health and be free from disease to be profitable producers of meat and fur, it is evident that sanitation is desirable not only for esthetic reasons but also because it may be a major factor in determining the financial success of the raiser. Extra care and effort expended in the process of cleaning, disinfecting, and maintaining a sanitary rabbitry contribute substantially to the profits.

### GENERAL PROCEDURE

Daily removal of manure, soiled bedding, and unused feed, and cleaning the hutches and equipment are primary essentials in maintaining a sanitary rabbitry. Urine-soaked bedding and manure are

extremely irritating to the animals, and care must be exercised to remove them and keep the hutches clean and dry. Accumulations of waste and filth attract flies, ants, and other possible spreaders of infection. Consequently, the early removal and safe disposal of such material are important factors in the control of disease. If the manure is to be spread on ground as fertilizer as soon as collected, it should be applied at some distance from the rabbitry. If it is to be stored awaiting final disposal, a pit screened against flies is a safe place. When necessary to pile it near the rabbitry, a waterproof box should be used or a sack of quicklime kept at hand for liberal application each time manure is added.

It is essential to remove manure at least once daily from hutches with solid floors. Daily cleaning, however, is a time-consuming task and rabbitries should be so planned as to make sanitation possible with the least work. Hutches constructed with wire mesh or perforated sheet-iron floors are recommended as they permit waste products to fall through and prevent contamination of the animals. Adequate drains should be provided to collect the excretions and permit them to be disposed of properly.

### CLEANING EQUIPMENT

Periodically cleaning and disinfecting not only hutches but also water crocks, feed troughs, and nest boxes are necessary precautions against disease. When possible, it is well to have extra water crocks, nest boxes, and feed troughs for use while soiled receptacles are being cleaned and disinfected. The practice of going from one hutch to another and cleaning the crocks or feeders with the same brush or cloth and immediately returning them to the hutches for continued use is a very common method of spreading infectious disease.

Water crocks may be cleaned by washing in hot, soapy water and rinsing in clear water to which a chlorine or other suitable disinfectant has been added. After rinsing, they should be stacked so that they will drain dry or, better still, placed where they will be exposed to the direct rays of the sun. Feed troughs should be treated in the same manner, except that if made of metal they should not be rinsed with a chlorine disinfectant because of its damaging effect. Instead, after being washed thoroughly and rinsed in clear water, they can be disinfected with live steam or by boiling. Feed troughs, water crocks, and all other small pieces of equipment can be effectively and economically disinfected by boiling in water for 25 to 30 minutes.

Poisonous disinfectants and those that have a pronounced odor should not be used on water crocks or feeding equipment unless these can be so thoroughly rinsed afterwards that all traces of poisons and the objectionable odors will be removed.

In cleaning and disinfecting nest boxes, hutches, or other equipment, it is better to take them apart as much as possible and disinfect each

piece separately. All dried substances should be removed by scraping or washing before further cleaning is attempted, as the presence of organic matter may impair the efficiency of the disinfectant used. After this preparation, each piece of equipment should be thoroughly scrubbed with a good chlorine disinfectant solution, lye, a compound of cresol, or some other coal-tar preparation. A careless attempt at disinfection is often more dangerous than none at all, since neglect in thoroughly disinfecting may serve only to spread diseases to other hutches. Incomplete disinfection allows disease germs to stay in cracks or crevices, where they remain a potential source of danger for an indefinite period.

### CHOOSING A DISINFECTANT

In selecting a disinfectant where a large area must be covered, relative efficiency as well as expense must be considered. Chlorine and coal-tar disinfectants, which are probably most commonly used for such purposes, can be readily obtained under a variety of trade names at almost any drug or hardware store. There is great variation in the phenol coefficient, or disinfecting power, of different disinfectants, and it is therefore advisable to use products that have a guaranteed standard of efficiency. A satisfactory disinfecting solution can be made from one of the coal-tar preparations that has a phenol coefficient of about 5, by adding approximately 1 pint of the disinfectant to 2 gallons of water. If the surface to be treated has been previously cleaned, the solution can be applied as a spray; otherwise it is better to use a brush equipped with a long handle and scrub the articles to be disinfected.

Although cresol solutions have the pronounced odor of other coal-tar products, they are frequently used and are relatively efficient as disinfectants. Cresol will not readily unite with water, but a mixture of cresol and soap is easily soluble in soft water, making a soapy suspension of greater efficiency, especially when used on soiled surfaces. For ordinary disinfecting purposes, such a compound solution should be used in the proportion of about 1 pint of cresol to 4 or 5 gallons of water.

A solution of ordinary lye, which is both economical and odorless, is a good disinfectant, but it has several disadvantages. Extremely caustic and poisonous in concentrated form, it is difficult to handle. Even weak solutions are injurious to paints, varnished surfaces, and enamelware. Because the concentrated product deteriorates rapidly when exposed to the air, a solution should be made from a can that has not previously been opened. For general disinfecting purposes a 1-pound can of lye should be dissolved in 5 or 6 gallons of water and applied either with a spray or with a long-handled brush, care being taken to allow none of it to touch the skin.

Quicklime has some disinfecting power and no objectionable odor, but it must be used when fresh because of its rapid deterioration when exposed to the air. It is commonly used beneath the hutches, in gutters, and in open drains.

Blow torches, or fire guns, although used extensively, have been found of little value as an effective means of disinfecting rabbit equipment. Application of a fire gun for 15 seconds to a section of cement floor, previously cleaned by mechanical means, will not destroy the bacteria present. When used on wood surfaces in the usual manner, the torch also fails to kill bacteria to a satisfactory extent. Furthermore, continued use of the fire gun may damage wire or wood equipment.

## INFECTIOUS DISEASES

Rabbits that are suspected of harboring infectious diseases or those that have died from unknown causes must be handled with extreme care in order to avoid contaminating the entire rabbitry. Sick animals should be isolated for some distance from the healthy stock, preferably in a fly-proof enclosure, until it is possible to determine the cause of the malady or until some suitable disposition can be made of them. Equipment, such as hutch, feeder, water crock, or nest box, that has been used by a sick animal or one that has died from an infectious disease should be cleaned and disinfected immediately.

Exposed animals that have been in contact with infected equipment or diseased animals should be isolated for 3 or 4 weeks and carefully observed for any symptoms of disease. All excreta from sick animals should be thoroughly treated with a liberal application of some good disinfectant, such as a 3-percent compound solution of cresol. Delay or neglect in disposing of dead rabbits immediately by burning or by deep burial may be responsible for the establishment of a serious focus of infection or for a wide dissemination of disease.

While being handled, dead or diseased animals should be prevented from coming in contact with clothing. The feed and water remaining in a hutch after the animal has been removed should be disposed of and not permitted to come in contact with other rabbits. After touching diseased or dead rabbits, the attendant should scrub his hands thoroughly before handling healthy stock. When only one person is caring for both diseased animals, which have been isolated in a quarantined area, and healthy stock, it is important that the latter be fed and cared for first. While working with the diseased group, the attendant should have special clothing, rubbers, and cleaning utensils, which should not be taken outside the quarantined area. On leaving the quarantined area he should remove the special clothing and rubbers and should wash his hands thoroughly. Carts and other equipment

used in disposing of manure and other waste should not be permitted to come in direct contact with rabbit feed.

When rabbits have been on display at shows, or when new stock has been purchased, it is always advisable to isolate these animals for at least 3 or 4 weeks before they are placed in the rabbitry. By following such a procedure it is often possible to detect a communicable disease that was in the incipient stage at the time the animals were isolated and thereby prevent its introduction into the rabbitry.

### PASTEURELLOSIS

Pasteurellosis assumes such varied appearances that it is sometimes difficult to recognize. One form was formerly known as contagious nasal catarrh, or snuffles, since the parts most commonly affected were the nasal passages and the sinuses.

*Cause.*—Pasteurellosis is caused by the bacterial organism *Pasteurella cuniculicida.* It is very similar to that found in hemorrhagic septicemia in other animals.

*Symptoms.*—In the nasal type of this disease there is a mucus discharge from the nose accompanied by frequent sneezing. This form of the disease, referred to by rabbit breeders as "a cold," is not necessarily fatal, but it may assume a chronic form and detract from the animal's appearance and value. In some cases the nasal discharge may subside but the animal remain a carrier of the organism, and under favorable conditions the disease may spread to a large proportion of the stock in the rabbitry.

An acute septicemic form of the disease, very similar to the typical hemorrhagic septicemia of farm animals, is usually fatal. This is most common in adult females, causing death usually in 24 to 48 hours. Autopsy reveals the lungs to be highly congested, with the inflammation extending into the trachea as well. A greatly enlarged spleen is also characteristic evidence of this disease. The surface of the intestine, as well as the tissues just beneath the skin, frequently shows small hemorrhagic areas. Positive diagnosis, however, can be made only by bacteriological examination.

Another common type of the disease is evidenced by abscesses, or boils, on various parts of the body just under the skin. The only symptoms are these swellings, which may grow very large and interfere with the animal's movements. On opening these abscesses a thick yellow pus is released. Encapsulated abscesses may also be found within the body cavity.

Adult breeding animals are sometimes affected with a form of pasteurellosis that attacks the genital tract. This is particularly dangerous, since in the process of mating the infection is readily spread among many animals. Infection of the reproductive organs

may be acute, causing death within 2 or 3 days, or it may become chronic, producing a purulent discharge from these organs.

*Prevention and control.*—In the prevention of pasteurellosis, success is in direct proportion to the degree of sanitation that is maintained in the rabbitry. Regular cleaning of the entire rabbitry and thorough cleaning and disinfecting of every hutch before a new animal is placed in it are measures that help to reduce the occurrence of all infectious diseases. Feed or water utensils should never be interchanged unless they are first thoroughly cleaned and disinfected.

Systematic precaution, when introducing new stock into the rabbitry, is the first essential of disease prevention. All new animals should be isolated at some distance from the healthy ones for a period of at least 4 weeks, and no animal that evidences a diseased condition should be introduced into a clean rabbitry. Breeding animals should not be handled more than is absolutely necessary. Under no condition should rabbits be permitted to come in contact with the stock feed supply. Dead animals should always be disposed of in the manner previously described.

When pasteurellosis is once introduced into a rabbitry, the results may be disastrous unless effective control measures are started immediately. There are several medicinal preparations and vaccines on the market that are sold as cures or protectives against this infection. Although vaccine may raise somewhat the resistance of an animal to the infection, it does not give satisfactory protection and, consequently, its use cannot be recommended. It is essential that all animals showing symptoms of the disease be isolated immediately, or slaughtered and disposed of by burning or deep burial. If diseased animals are not slaughtered, one part of the premises should be set aside for quarantine of such stock. The attendant should protect his clothes with an apron or coat while conducting any of these control measures and should wash his hands thoroughly afterward.

In rabbitries in which only a few animals are affected, it is advisable to remove by slaughter the infected individuals. Rabbitries in which a large part of the stock is infected may be advantageously divided into two units—noninfected and diseased. If effective quarantine is maintained between the two groups, a sufficient number of healthy breeding animals may be developed to supply the requirements of the establishment and to permit the later disposal of all animals showing symptoms of the disease.

The use of medicinal preparations to cure the nasal catarrhal form is not advisable. Most preparations sold for this purpose dry up the nasal secretions for a time, but the condition usually recurs, and the animals serve as carriers of the infection in the herd. Since the vitamins present in green, leafy feeds are very beneficial in protecting

against respiratory infections, fresh greens in moderate quantity should constitute a part of the daily ration.

Animals affected with abscesses under the skin, or boils, can usually be restored to usefulness if given extra attention. An abscess should not be permitted to break, as that serves to spread the infection, but should be cared for as soon as found. The hair should be clipped away from the infected part and the abscess lanced with a sharp knife at its lowest point. All the contents should be pressed out and the interior swabbed with a one-half strength tincture of iodine applied with a small piece of absorbent cotton on a piece of wood. Precaution must be taken to collect all discharge from an abscess on a piece of paper or cloth, which must be promptly burned and not permitted to come in contact with other animals. Rabbits treated for boils should be regarded as carriers of the disease and should be placed in quarantine.

Treatment for the septicemia form of the disease and for the type attacking the reproductive organs should not be attempted. Animals thus affected are a menace to the herd and should be disposed of as soon as such a diagnosis is made.

### MYXOMATOSIS, OR MOSQUITO DISEASE

Myxomatosis, a specific, fatal, infectious disease, was first found in Mexico among domestic rabbits maintained for laboratory purposes. During the late summer of 1927 a shipment of domestic rabbits, to be used for laboratory purposes, was sent from Lower California, Mexico, to San Diego, Calif. When received some of the animals were dead and others were just beginning to show symptoms of myxomatosis.

In the summer of 1928 this disease appeared in domestic rabbitries in and about the city of San Diego and then spread slowly over San Diego County. Within a 4-year period myxomatosis was found affecting domestic rabbits in Los Angeles areas. The following year it had spread northward along the coast to Hayward and San Jose. In the summer of 1937 cases were reported by scientific workers near Corvallis, Oreg. During 1938–1939 cases of myxomatosis were found 100 miles inland (from coastal areas), and observations indicate that the disease will probably continue to spread.

*Cause.*—Myxomatosis, called mosquito disease by some rabbit breeders, is caused by a filtrable virus, myxomatosum. When mosquitoes are numerous about rabbitries, the disease is frequently found to be prevalent. Recent experiments have demonstrated that these insects may be one of the carriers that transmit the disease from infected to noninfected domestic rabbits. Other investigators also have found that fleas may transmit the disease from one rabbit to another.

Myxomatosis is highly infectious among rabbits, but it does not appear to be transmissible to man or to other animals. A minute quantity of blood or of the discharge from the eye or nose of an affected animal is capable of reproducing the disease in a susceptible animal if introduced into a scratch in the skin or placed in the eye. Animals artificially infected with the virus show symptoms of the disease in about 10 days, and usually die within 4 or 5 days after the appearance of the first symptoms.

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***Figure 1.*—Rabbit affected with myxomatosis.**

*Symptoms.*—Animals affected with infectious myxomatosis (fig. 1) display lack of appetite, inflamed eyes with a purulent discharge, and a rough coat. The eyelids, nose, lips, ears, and external sexual organs become congested and swollen. Swelling of the ears causes those parts to become heavy and pendulous—a characteristic symptom. As the swelling around the body openings increases with the progress of the disease, there is a purulent discharge from the nose as well as from the eyes, breathing is labored, and the animal becomes comatose. The disease is usually fatal, and when it is introduced into a rabbitry the mortality may be 95 percent of the animals over 60 days old. The young are less frequently affected. In the few cases that are not fatal, the swelling gradually subsides, leaving in its place firm, wart-like protusions around the ears, nose, and feet.

Animals that die as a result of myxomatosis reveal no characteristic internal changes, and positive diagnosis can be made only by laboratory procedures. If the swollen parts are cut into, the cut surface is white, gelatinous, and glistening, and will bulge slightly. When pressed, the surface exudes a clear serum. Internally there is often a congestion or partial solidification of the lungs. The spleen is enlarged, dark, and pulpy. All blood vessels close to the body surfaces are congested with blood.

*Prevention and control.*—Recent field experiments in areas where the disease has caused severe losses have demonstrated the possibility of maintaining healthy rabbits in infected areas by screening the hutches against insects. Various volatile insect sprays used every 8 hours are fairly effective in controlling mosquitoes in rabbitries.

Although it is possible to immunize rabbits against myxomatosis, the process available at present is too costly and complicated for use except in unusual instances. The best method of control consists of early recognition of the disease and immediate destruction of all animals showing symptoms. Dead animals and all the bedding, litter, and unused feed in pens in which affected or exposed animals have been kept should be burned or buried immediately several feet underground. Exposed animals—those that have been in contact with or associated with affected stock—should be removed from the rabbitry and kept in isolated quarters for 2 weeks, and all equipment should be thoroughly scrubbed with a good disinfecting solution.

In selecting a site for a rabbitry it is well to remember the possibility of insect transmission of this and other diseases and to choose a place comparatively free from the disease carriers. When insects are present in large numbers, it is often difficult to protect the animals from infection.

### PNEUMONIA

Pneumonia, or inflammation of the lungs, may involve parts or almost all of one or both lungs.

*Cause.*—Pneumonia often occurs in domestic rabbits as a result of exposure to drafts, sudden changes of temperature, becoming wet, or of specific infections. Any condition that causes a lowering of vitality in the animals predisposes them to this disease. In that event various bacteria may cause severe pathological changes.

*Symptoms.*—Rabbits affected with pneumonia lack appetite, breathe with difficulty, and are droopy and listless. Depending on the cause and stage of the disease, there may be a watery or purulent discharge from the eyes and a mucous discharge from the nose. If such animals are autopsied, the lungs will be found to be mottled in appearance and to show patches of gray and red. In more severe cases, the entire lungs are of the color and consistency of liver. In chronic stages

of the disease abscesses may form, the surrounding lung tissue becoming solid and of cheese-like consistency.

*Prevention and control.*—Domestic rabbits should be provided at all times with well ventilated hutches that protect the animals from dampness, drafts, and extremes of heat and cold. As pneumonia is frequently secondary to other infectious diseases, it is advisable to dispose of all affected animals. Pneumonia seldom assumes the proportions of an acute epizootic, and deaths from it alone, without complications, are not frequent.

### SPIROCHETOSIS

Spirochetosis affects rabbits of both sexes, but is not transmissible to other domestic animals or to man. The interval between the time of infection and the manifestation of symptoms of the disease may vary from 2 to 4 weeks, and unless careful routine observations are made, the disease may become widespread and most of the breeding stock become affected before it is detected. The animals probably contract the disease most readily when mating. Spirochetosis, or true vent disease of domestic rabbits, is caused by a micro-organism (*Treponema cuniculi*) which is transmitted from one animal to another in mating.

*Cause.*—In a considerable number of cases it is possible to reproduce the disease with secretions containing this organism from the diseased genitalia of affected animals, but it is generally difficult to effect artificial transmission to healthy animals that have no abrasion in the skin.

*Symptoms.*—The first symptoms of spirochetosis are usually the appearance of small denuded places around the vent and their slow enlargement until small vesicles or blisters are formed. These vesicles soon rupture and the areas become covered with heavy scabs. The severity of the disease varies with the individual animal. In some cases the affected part will remain red, congested, and slightly ulcerated without the usual brown crusts. The denuded areas are usually confined to the external genitalia, but occasionally they spread to the lips, eyelids, and regions of the hocks. This probably results from contact with affected parts, as the organism is reported to be confined to the immediate vicinity of the lesions and is not found in the blood or internal organs. If there are no complications, affected animals usually remain in good physical condition, exhibiting no other symptoms of the disease. Since in a superficial examination the disease is easily confused with other conditions arising from entirely different causes, it is advisable to submit one or more of the suspected animals to a trained veterinarian, as a positive diagnosis is possible only after a careful microscopic examination.

*Prevention and control.*—The first essential in preventing the spread of spirochetosis in domestic rabbits is a thorough examination of the external genitalia in both the male and female animals before each mating. An animal that shows lesions of any kind around the vent should not be used for breeding purposes until the condition has disappeared.

Affected animals should be treated first by clipping the hair from around the involved area. This should be followed by removing all the discharges and crusts, care being taken not to cause the part to bleed. Then the area should be sponged with a piece of absorbent cotton soaked in a boric acid solution or in warm water to which a pinch of salt has been added. The remaining scabs often can be removed without difficulty during subsequent cleanings. A very effective ointment consists of lanolin, 3 parts, and calomel, 1 part, rubbed well upon the affected areas. It should be applied in a thin coating to the affected parts after they have been cleaned in the manner described. Treatment should be given three or four times a week, always after a thorough cleaning. For an infected buck, iodine may be used on the external lesions, but in case it is necessary to treat the interior of the sheath, a less irritating antiseptic, such as a 1-to-1,000 solution of potassium permanganate, should be used.

Lesions usually heal within 10 days to 2 weeks, but as the disease may recur, it is essential that treated animals be examined at regular intervals. Recovered animals can be bred without danger of infecting others when the lesions have entirely healed. It is necessary to keep the floors of the hutches clean and dry at all times, as the presence of urine-soaked bedding or manure tends to aggravate the disease.

### MISCELLANEOUS VENT INFECTIONS

Various bacterial infections that occur around the external reproductive organs of domestic rabbits are often mistaken by the rabbit breeder for infectious spirochetosis. Such infections are usually revealed around the vent in the form of small pustules filled with a white, cheesy substance. Occasionally one ruptures and the spot becomes covered with a heavy scab. Treatment consists of opening the pustules with a sterile needle or small knife, pressing out the cheesy substance, and painting the area with tincture of iodine. Recovery is usually rapid, but the animal should not be mated until the pustules heal. The condition is easily prevented by keeping the hutch floors clean, dry, and smooth.

During routine examinations of breeding rabbits for abnormal conditions, it is advisable to clean away any dirt or filth that may be present around the genitalia. In the operation the small pockets normally present on both sides of the vent should not be overlooked. These pockets usually contain surplus fatty material that should be removed

with a swab moistened with a mild antiseptic solution. Because of individual habits of some rabbits, frequent cleaning of these pockets is necessary.

### TULAREMIA

Tularemia is an infectious disease that affects man as well as a wide variety of animals. It occurs in wild animals in many parts of the country, but it has never been found as a natural infection in domestic rabbits. Although domestic rabbits are susceptible to the disease and are used for laboratory tests in an effort to diagnose tularemia, the usual manner in which these animals are raised does not expose them to the insects involved in the spread of this disease.

### EYE INFECTIONS

The eyes of young rabbits in the nest box frequently become contaminated with infectious organisms from the bedding or from the soiled fur of the doe. The miscellaneous organisms usually found in these eye infections generally produce a milky discharge, causing the lids to become sealed together. At the same time the eyeball becomes red and appears to be covered with a film.

*Prevention and control.*—Obviously it is important to keep the pen and nest box clean at all times, especially when suckling rabbits are present. Even with the best precautions eye infections may occur. Swabbing with a warm, 4-percent boric acid solution and gently removing the secretions once or twice daily is advised. If the condition is not helped within a week or 10 days, the use of a 5-percent solution of argyrol may bring relief. This should be applied only after the affected parts have been cleansed with a warm boric acid solution and dried with soft cotton.

## NONINFECTIOUS DISEASES

### MUCOID ENTERITIS, OR BLOAT

Mortality from digestive disturbances is sometimes attributed to the kind of feed provided. One such digestive ailment that causes considerable financial loss to the industry each year is known to rabbit breeders as mucoid enteritis, or bloat. A few years ago, before domestic rabbits were raised in sufficient numbers to be of commercial importance, mortality due to this disease did not attract attention. As soon as attempts were made to produce rabbit meat in greater volume, however, mucoid enteritis assumed epizootic proportions and now is found wherever domestic rabbits are produced in large numbers.

*Cause.*—All efforts to reproduce the disease experimentally have failed. Observations seem to indicate that it is not infectious and that sanitary measures have little effect in preventing its occurrence.

In attempts to isolate the causative agent of mucoid enteritis all experiments performed have given negative results. The information derived therefrom, however, has been of considerable importance in keeping mortality at the minimum.

*Symptoms.*—Mucoid enteritis may affect rabbits of both sexes and of all ages, but it is more common in the younger animals during the first 16 months of life. The earliest characteristic symptoms are lack of appetite, lusterless eyes which appear to squint, a rough dull fur coat, and grinding of the teeth. Animals may display intense thirst and sit by the water crock drinking at frequent intervals (fig. 2). The

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***Figure 2.*—Characteristic posture of rabbit affected with mucoid enteritis, or bloat.**

abdomen in some of the affected rabbits may be bloated and distended with gas, but the presence and degree of this symptom are variable. Other animals may exhibit symptoms of either constipation or diarrhea, but usually a considerable quantity of gelatinous-like material is voided. In animals 5 to 8 weeks of age these symptoms may continue from 24 to 72 hours, and usually terminate in the death of the rabbits. In junior and adult animals, however, the duration is usually much longer, and the condition is less frequently fatal. Autopsies of young animals reveal few, if any, great changes, so it is difficult for an untrained observer definitely to diagnose this specific condition in rabbits less than 3 weeks old. Any nonspecific diarrhea that is common in very young animals may closely resemble this disease. The

stomach and upper part of the small intestine are usually filled with water and are occasionally distended with gas, and sometimes contain partially decomposed food. In a few cases the lining of the small intestine becomes congested. Hemorrhages frequently occur in the walls of the cecum. The contents of this part of the digestive tract are frequently devoid of the normal quantity of fluid and at times near the tip of the cecum they are dehydrated and dry to the touch. Intestinal contents under normal conditions should be of semifluid consistency. A small percentage of autopsies reveals free blood in the lumen of the small intestine and resulting anemia in all vital organs. Part of the colon, or lower bowel, frequently contains a large quantity of clear, viscid, mucoid material, although the posterior end of this organ is usually empty.

In older animals the disease may be present for a sufficient length of time to produce extensive changes. In some cases the lining of the upper part of the small intestine, or duodenum, may be cheesy, or at times it may have ulcerated areas of various sizes, which frequently perforate the intestinal wall. In other instances lesions are not sufficiently distinct to permit a differentiation between this malady and certain types of acute dysentery. No changes in lungs, liver, or spleen have been found, except as a secondary result.

*Prevention and control.*—As yet no effective treatment is known for mucoid enteritis in animals under weaning age, and the mortality among those affected with the disease may be as high as 95 percent. Some proprietary compounds, advertised as having beneficial effects, have been tested and proved worthless.

It is recommended that the digestive organs of junior and adult animals affected with this disease be given a complete rest. The removal of all feed and water for 48 hours followed by offering small quantities of fresh, green vegetation has brought good results. After the fourth day the rabbits may be given water once daily in addition to the green feed. An animal should have access to water for only a few minutes to prevent it from taking excessive quantities that might cause renewal of the trouble. After about 8 days a small quantity of good hay, preferably alfalfa, may be given, but care must be exercised not to overfeed. A few days later small quantities of grain may be added to the ration with a gradual increase to the normal supply.

## MISCELLANEOUS INJURIES AND ABNORMALITIES

### SORE HOCKS

Old, extremely heavy rabbits or those in poor condition, if kept in hutches with hardware-cloth bottoms, frequently suffer from sore hocks. Unsanitary hutches where urine-soaked debris is permitted to

accumulate are also frequently responsible for the developing of sores on the feet of animals because the urine is particularly irritating to the skin.

*Symptoms.*—Rabbits suffering from sore hocks may eat very little food and sit in a cramped or humped position. They move about the hutch with a stilted motion, indicating that placing weight upon the inflamed areas causes considerable pain. Another evidence of tenderness is the raising and lowering of the feet in rapid, successive movements. Affected rabbits become thinner as the condition progresses and often refuse to breed.

This disease is manifested by a sore, variable in severity, below the hocks on the hind legs. Such sores, or ulcers, may be found on the bottoms of the front feet as well. Some breeds, such as the Castor-Rex, which have a very thin padding of fur on the legs and feet, are particularly susceptible.

*Prevention and control.*—Sore hocks may be treated successfully, unless extensive abscesses have formed. Adherent or adjacent matted hair should be clipped off, the affected areas washed with warm, soapy water, and all loose scabs and debris carefully removed. After the parts are thoroughly dried, pine tar, zinc ointment, or iodine ointment should be applied every other day until healing is well under way. Pine tar and iodine ointment have one disadvantage in that they stain the fur. Healing will take place more readily if the affected rabbits are confined in a pen on well-drained, clean sod. In such a place mild cases of sore hocks will often heal without medication.

In the more serious cases, where abscesses have formed, it is recommended that the animals be destroyed, unless they represent especially valuable breeding lines. If it is deemed advisable to treat these severe cases, the affected animals should be isolated in order to help prevent the spread of the infection throughout the herd. The abscesses should be lanced, opening them to the bottom of the cavity, to insure drainage. Thoroughly press out the pus, and flush out the cavity with a disinfectant solution, preferably a dilute tincture of iodine. Examine the animals every other day to see that proper drainage is taking place, and repeat the treatment as long as pus continues to form. Healing, to be permanent, must take place from the bottom of the cavity outward.

Since the cause of sore hocks is mechanical and the condition develops in hutches with wire floors, it is obvious that wire floors that have a tendency to sag, have rough spots, or are uneven should be replaced with smooth surfaces. Does in a poor state of nutrition and all rabbits that suffer from sore hocks, should be provided with a smooth board or places with even surfaces in their hutches until they are physically improved and the sores on the hocks have disap-

peared. It has been found that the use of perforated sheet metal to replace hardware cloth in hutches is particularly effective in reducing cases of sore hocks in domestic rabbits.

### MAMMITIS, OR CAKED UDDER

Mammitis usually develops in nursing does within the 30-day period following kindling, but the condition may occur at any time during lactation. Does that are heavy milk producers are most likely to be affected. Junior does kindling for the first time may, however, develop caked udder.

*Cause.*—Within a few hours after kindling there is a great change in the mammary tissue. The young rabbits do not always consume all the milk, and consequently a quantity accumulates in the mammary tissue and causes swelling and inflammation.

Mammitis sometimes results from injured nipples, bitten or lacerated by the young. Improperly constructed nest boxes may also cause a nursing doe to bruise the pendulous udder.

Bacterial infections of the breast may be another cause of mammitis. Except for slight variations, infections in the mammary tissue of rabbits present the same appearance as inflammation resulting from mechanical causes or from injury.

*Symptoms.*—Mammitis is an inflammation of the milk-secreting organs, or mammary glands, involving a swelling of the tissue. As the condition advances, these organs develop redness and heat. They become painful to the touch, and the doe refuses to allow the young to nurse. In mammitis the udders usually produce pus, and if the milk is withdrawn and examined microscopically, pus cells and occasional bacteria are observable.

*Prevention and control.*—Some does will voluntarily reduce the quantity of feed eaten for a period of several days before and after kindling. During such times the does should be fed moderate quantities of fresh green, succulent food, which acts as a laxative.

When mammitis occurs from lacerated nipples or other injuries of the mammary tissue, the quantity of grain concentrates fed the doe as a daily ration should be drastically reduced and replaced with fresh green feed and first-quality, leafy hay.

Bacterial infections in the mammary tissue are extremely difficult to treat and the affected rabbits should be placed under the care of a veterinarian. If such cases are improperly handled, the results are usually unsatisfactory and frequently death ensues.

### INDIGESTION, OR SLOBBERS

Indigestion, or slobbers as it is frequently called, is usually the result of overfeeding domestic rabbits with fresh, succulent green

vegetation or of using fermented feed, which causes an acute inflammation of the stomach and intestines. The disease has been often observed among rabbits maintained in unsanitary and poorly ventilated hutches and fed on rations composed of waste produce obtained from vegetable markets.

*Symptoms.*—Young animals of less than 8 weeks of age are most often affected with indigestion. Saliva drivels from their mouths, so that the fur beneath the chin and between the front legs becomes wet and soiled. They refuse food and sit listlessly in a corner of the cage; their fur becomes rough and their eyes dull.

*Prevention and control.*—Although the mortality from indigestion is not particularly high in domestic rabbits, this ailment may bring about poor physical condition in an entire group. If placed on dry feed for a few days and the proportion of fresh, green plants reduced, the animals generally make complete recovery. Boiled milk and dry bread are recommended as a satisfactory diet. In more severe cases, small doses of sodium bicarbonate dissolved in warm water bring good results.

### DIARRHEA

Diarrhea is any abnormal condition in the intestinal tract that causes an unusual quantity of fluid to be excreted with the feces at frequent intervals. It may occur at all ages, from very young animals to adults.

*Cause.*—Diarrhea in domestic rabbits is frequently the result of infectious, parasitic, or other specific diseases. It may also be caused by injudicious feeding as well as by sudden radical changes in the ration.

*Symptoms.*—Symptoms in affected animals are a loose, watery stool (frequently having an offensive odor), a rapid loss in weight, and general debility followed by extreme weakness. Stained fur is often the first evidence of sickness. Severe diarrhea, accompanied by indigestion resulting from changing diet or spoiled feed, frequently terminates fatally within 24 hours.

*Prevention and control.*—In many cases it is difficult, or even impossible, to differentiate between cases of acute diarrhea and the condition known as bloat in domestic rabbits. The less acute condition of bloat may show definite changes within the intestinal tract that are not observed in cases of acute diarrhea. Only succulent green plants that are fresh should be fed to domestic rabbits, and such food should be supplied daily in small rather than in large quantities, at irregular intervals. Spoiled or moldy feed should never be given. Affected animals may respond to a boiled milk and dry feed ration, including well-cured alfalfa hay and dry grain mixture. Bismuth

subnitrate or bismuth subgallate in doses of 3 or 4 grains has been recommended for cases of acute diarrhea.

### WRY NECK

Wry neck in domestic rabbits is manifested by a turning of the head to one side with incoordination of movements. In extreme cases the animal is unable to maintain its upright position and when it attempts to rise, will roll over once or twice. Although wry neck is said to be caused by the presence of ear mites in the middle ear, the source of this disease in some cases cannot be determined. Nevertheless the inner ears of affected animals should be carefully examined to determine the presence of mites or ear infection.

When this condition is due to ear mites, treatment consists of the removal of the parasites by appropriate means—described under parasites—and the clearing up of the infection. If the nerve tissue has not suffered too much injury, recovery may follow.

### URINE BURN

Small denuded areas around the external genitalia of domestic rabbits caused by irritation from urine are frequently confused with similar conditions resulting from infectious vent diseases. In severe cases of urine burn, however, the small raw areas rapidly enlarge and coalesce until they are denuded of hair and skin, and sometimes become infected with contaminating organisms causing a purulent discharge. Unless this is given prompt attention there may be a fatal termination. In less severe cases the lesions become covered with a heavy scab, the removal of which without proper precautions may cause severe hemorrhage. It is this type of the disease that closely resembles and is frequently mistaken for infectious spirochetosis. Urine burn results usually from the animal's constant contact with urine-soaked bedding or waste material on the floor of the hutch. A similar condition has been observed in rabbits when caustic disinfectants have been used excessively in cleaning the hutch floor.

Solid wooden floors or lath-bottom hutches are frequently responsible for urine burn, because wood of the quality ordinarily used in the construction of hutches absorbs the urine and the floors thus become a constant source of irritation to the feet, hocks, and external genitalia. Where such a condition exists, it may be controlled by thoroughly scrubbing the floor three or four times a week. Each cleaning should be followed by flushing with clear water. If such measures are not practicable, it may be necessary to remove the urine-saturated parts of the floor and replace them periodically with fresh wood or permanently with hardware cloth.

The prevention of urine burn and resulting infections depends entirely on sanitary precautions, such as keeping the hutch free of urine-

soaked bedding, hair mats, and manure. Mild cases usually recover promptly without other treatment than removal of the cause. More severe cases may be successfully treated with the ointment recommended for spirochetosis, consisting of 3 parts of lanolin and 1 part of calomel.

Misinformation concerning the cause and contagiousness of certain diseases that affect the external reproductive organs of domestic rabbits has frequently influenced breeders to dispose of large numbers of their breeding animals at a loss, when the intelligent application of more conservative control measures would have been effective. Unscrupulous dealers have profited by this lack of information among rabbit breeders and have obtained stock for a small part of its actual value, when, with a little additional attention, the animals could have been restored to health.

Whenever a rabbit producer observes some condition in his animals that he does not understand, he should consult a veterinarian or a diagnostic laboratory to obtain an accurate diagnosis and unbiased advice on control measures.

### WET DEWLAPS

Wet dewlaps, or briskets, are frequently observed in adults of the New Zealand and other large breeds of rabbits. The entire dewlap may be affected. While drinking, some rabbits extend the neck in such a manner as to permit the dewlap as well as the chin to be in the water, so that the heavy fur covering the dewlap becomes soaked. When a rabbit sits in a normal position, the dewlap hangs in natural folds over the chest and when unusually pendulous, it does not readily dry out. Constant moisture under dense, matted fur, combined with the natural body heat, causes the skin to become infected, reddened, and sore. The fur around the inflamed area gives off a fetid odor and eventually sluffs off, leaving a reddened and denuded skin. Because of the irritation the rabbit has a tendency to scratch the area, which action increases the inflammation.

*Prevention and control.*—As soon as the attendant observes a rabbit with a constantly wet dewlap, the animal should be removed from its hutch and the fur clipped from the wet area and a space approximately an inch beyond it. The affected spot should then be washed with warm, soapy water and thoroughly dried with a cloth or absorbent cotton. A liberal quantity of carbolated petrolatum should be applied to the dried area and gently but firmly rubbed in with the fingers. The skin usually heals completely within 2 weeks.

In order to prevent the rabbit from dipping more than the mouth into the water, the water crock should be placed upon a block of wood or brick so that the animal will have to reach up to drink. This suggestion may not be practicable in some hutches because of their con-

struction, but the same effect can be obtained by partially covering the crock or allowing only a part of it to project within the hutch.

### PLANT POISONING

Occasional losses occur among domestic rabbits as a result of eating forage containing injurious plants. Poisonous weeds are sometimes mixed with hay and straw. In certain areas the broad-leafed milkweed (*Asclepias eriocarpa*) is found in roughage fed to rabbits and, when eaten, causes marked symptoms of enteritis, nervous disorders, and a staggering gait. Weakness increases until the affected animals become completely prostrated and die. The temperature may fluctuate, but for a considerable period before death it is usually below normal.

On autopsy the stomach and intestinal canal reveal hemorrhagic areas, and the intestine frequently contains a catarrhal secretion. The urinary system also shows the results of the irritating properties of the poison. The kidneys are swollen with hemorrhages beneath the capsule. The liver is also enlarged and dark. As a control measure, careful inspection of the forage given rabbits should be made to eliminate all objectionable weeds.

## PARASITIC DISEASES

Diseases caused by parasites, both external and internal, vary considerably in their importance. Treatment of affected animals should not be undertaken except by or under the direction of a veterinarian.

If only a few rabbits are infested, it may be more economical to eliminate them from the rabbitry than to attempt a cure by expensive and tedious means. Parasitic infestation can be prevented to a large extent by following approved sanitary measures.

Breeders should bear in mind that parasitic diseases of rabbits are spread through close association with affected animals, through infested hutches, or, in the case of internal parasites, through contact with the droppings.

### EXTERNAL PARASITES

Those parasites that live on the skin or burrow beneath its surface are called external parasites; and those that live in the internal organs are known as internal parasites. Some of the former may burrow through the skin but do not cause any serious damage to the underlying muscle tissues.

### EAR MANGE

*Cause.*—Ear mange of rabbits, like mange of other types, is caused by very small mites which irritate the skin. Those thriving on the inner surface of the ears inflict such injury as to cause the oozing of

serum and blood, which harden and form large accumulations of crusts or scabs. Although there are two distinct species of mites (*Psoroptes communis cuniculi* and *Chorioptes cuniculi*) that attack the ears of rabbits, the conditions caused by them are similar.

*Symptoms.*—The first evidence of infestation of rabbits with ear mites is an excessive and gradually increasing moisture of the inner surface of the ear. As the disease progresses, the animal frequently shakes its head and attempts to scratch the affected parts with its feet. The stage when large crusts are formed and a fetid odor develops is often called canker of the ear. The constant activity of the mites on the delicate skin of the ear may produce nervous symptoms, and ear mange has been ascribed as being one of the causes of wry neck. The animals in severe cases become unthrifty and a considerable loss of flesh may result. Reproduction may be interfered with in a rabbitry where the disease is widespread.

*Prevention and control.*—Although ear mange spreads rapidly from animal to animal, it is not difficult to control if persistent treatments are given.

Treatment for ear mange is relatively simple. The ear should be cleansed thoroughly with slightly warmed olive oil and all the loose caked discharge and scab carefully removed. A salve should be applied. The following preparations have been used successfully: (1) 2 parts of iodoform, 10 parts of ether, and 25 parts of olive oil, petrolatum, or cottonseed oil; (2) a 1-percent solution of carbolic acid or creosote in glycerin; and (3) a 5-percent solution of carbolic acid in olive oil or castor oil. Applications should be made with a cotton swab on a wooden applicator or on blunt forceps, and treatment repeated at 10-day intervals until the animal is cured. Hutches in which rabbits affected with ear mange have been kept should be cleared of all litter and straw and thoroughly cleaned with an insecticidal solution of sufficient strength to destroy any mites that may have survived in cracks and crevices. Unless this precautionary measure is taken, the disease may reappear.

### SKIN MANGE

*Cause.*—Although two distinct species of mites (*Sarcoptes scabei cuniculi* and *Notoderes minor cuniculi*) are described as parasites causing mange on the skin of rabbits, there is no necessity for the rabbit breeder to distinguish between them. Their behavior and the diseases caused by them are similar. They are easily transmitted from one animal to another by direct or indirect contact, and an entire rabbitry may be affected within a short time.

*Symptoms.*—The small mites that bring on skin mange burrow beneath the surface of the epidermis and a serum exudes which dries and forms scabs. On these areas the hair drops out and itching is

evidenced by the frequent rubbing and scratching by the animal. The head is the usual site of skin mange in rabbits, although the disease may spread to the legs and body.

*Prevention and control.*—Although individual animals can be successfully treated for skin mange, the cost of curative measures and the danger of infecting other rabbits in the herd make it debatable whether one should attempt to treat a few infested animals or promptly dispose of them. The value of the diseased individuals and the possibilities of isolating them so as to prevent dissemination of the mites should determine the course to be followed.

Treatment consists of clipping the fur from the affected parts, care being taken to locate all areas where the disease is present. After being softened with warm applications of soapy water, as much of the crusts and scabs should be removed as is possible without causing bleeding. Then one of the following preparations may be used: (1) Flowers of sulphur, 1 part, and lard, 4 parts; or (2) liquid oil of tar, 1 part, and liquid petrolatum, 5 parts.

Applications should be made daily for one week, rubbing the ointment well into the skin and somewhat beyond the margin of the lesions in order to kill mites attacking new areas.

Hutches in which mangy stock has been confined should be disinfected or washed, preferably with some light oil, in order to kill the mites that may be lurking in the crevices. The disease may be transmitted through contaminated hutches and bedding.

### LICE

Louse infestation is not common in rabbits, and when it occurs, is usually associated with poor hygienic conditions. In poor environment these parasites may spread to a large part of the stock.

*Cause.*—The louse commonly found on rabbits is *Haemodispus ventricosus.* It thrives on the blood of the animal, which it obtains by inserting its mouth parts into the skin.

*Symptoms.*—Because of the irritation resulting from the bites of this parasite while feeding, the affected animals suffer an itching sensation to which they respond by rubbing and scratching at frequent intervals, so that in heavy infestations large areas of the skin become denuded of fur and considerable redness occurs. On close observation one can detect the eggs of lice—very small yellowish-white, oval objects—adhering tightly to the hairs. The adult lice are gray with brown on the abdomen.

*Prevention and control.*—Because certain rabbits are less susceptible to louse infestation than others, only a part of the animals may become infested; but in order to eliminate the pests, it is essential to treat all the animals that have been closely associated with infested individuals as well as those on which the parasites may be found.

In cold weather the use of liquids and ointments is objectionable. Derris, rotenone, and pyrethrum powders are useful in combating louse infestations, but since there is a great variation in the quality of these substances—because of impurities and deterioration from age—it is important to use only potent products. These powders should be dusted well into the fur as it is gently rubbed forward, in order to distribute the powder thoroughly throughout the coat and over the skin. Several applications about 3 to 5 days apart are recommended.

Dilute anthracene oil, or almost any other bland oil, is very effective against these parasites and is usable in warm weather. The excess oil, after application, should be removed by rubbing the coat with sawdust or bran. These oil treatments should be followed in a few hours by a bath in warm, soapy water, since the effect of oil on the skin of fur animals is very depressing. The eggs attached to the fur are more resistant to treatment than are the adult lice. Because the eggs require 10 to 15 days to hatch, any treatments for lice should be spaced so as to kill those that develop from the remaining eggs after the original infestation of live parasites has been destroyed.

### WARBLES

A large grub, or warble (fig. 3), is frequently found in rabbits maintained in exposed places. Different species of similar parasites occur in other animals, as for example, cattle.

*Figure 3.*—**Warble from rabbit. Larva of *Cuterebra cuniculi*. (Twice natural size.) (From Annual Report, New York State Veterinary College, for 1926–27, Legislative Document 18.)**

*Cause.*—The warble commonly found in rabbits is the larval stage of the fly *Cuterebra cuniculi.* The adult fly deposits the eggs on the fur. After hatching, the young larvae burrow beneath the skin, causing swelling and considerable irritation.

*Symptoms.*—The location of these warbles can be detected when the rabbit attempts to lick the irritated spot. Examination will reveal the presence of an enlargement, moisture, and in the center an opening into the skin. By close observation one can see the larva just inside this opening. Considerable damage is done to young rabbits by the parasitic growth and gradual enlargement. The warble is almost constantly active, moving about within the cavity and destroying surrounding tissue.

*Prevention and control.*—Obviously the only sure means of preventing attacks by this parasite is to screen the hutches and pens in such a manner as to prevent the entrance of the fly. Usually these flies do not go through ordinary hardware cloth, and window screening will prevent their entrance. Attacks are more prevalent among animals maintained in large open yards.

The warbles can be forcibly removed by grasping them firmly with small forceps. This operation can be much simplified by first injecting into the opening, with a medicine dropper or syringe, a few drops of chloroform. This will usually cause the larger larvae to come out voluntarily, although they may become helpless before they can pass through the opening, and mechanical removal thus may also be necessary. The wound generally heals promptly after the removal of the grub, although the application of a mild antiseptic solution will produce beneficial results.

### RINGWORM

Occasionally rabbits are affected with a parasitic fungus disease known as ringworm, similar to that attacking man and other animals. The lesions are round or oval patches usually ½ to ¾ inch in diameter covered with scaly crusts and small, reddish points appearing about the enlarged hair follicles. The usual places for these attacks are on the head and hind feet. On the face the lesions sometimes become very extensive, giving the animal a grotesque appearance. Except in severe cases, however, little irritation is caused. It is apparent that some animals are much more susceptible to the infection than are others.

*Cause.*—Ringworm in rabbits is caused by a fungus (*Trichophyton tonsurans*), which is not unlike that causing a similar disease in other domestic animals and in human beings.

*Symptoms.*—Affected animals may go unnoticed for some time unless they are given close inspection. As the disease advances, circular plaques ½ to 1 inch in diameter appear on the face and ears, and

less frequently on the feet and abdomen. These areas do not necessarily become sensitive to the touch although a noticeable redness is present in the skin. After the affected areas have been established for some time the fur breaks off at the surface of the skin, leaving a scaly, raised surface.

*Prevention and control.*—Rabbits having ringworm should be isolated from the remainder of the herd. As in mange, the hair should be trimmed away from the affected areas and the scaly crusts bathed in warm, soapy water. After drying, a daily application (for 3 or 4 days) of tincture of iodine is recommended. A 10-percent solution of salicylic acid (daily applications for a week) is also good.

### INTERNAL PARASITES

A great variety of organisms, generally referred to as parasites, are of considerable importance, because they live in the bodies of animals and cause disease by attacking tissues and organs. Although larger than bacteria, some are very small and can be seen only when magnified. In domestic rabbits maintained in the ordinary types of hutches there are only a few kinds that warrant attention in a publication of this character.

#### COCCIDIA

Coccidiosis is one of the commoner and one of the most destructive parasitic diseases of domestic rabbits. It may occur in one form or another in a large proportion of rabbitries, yet, if good sanitation is maintained, it does not become serious.

*Cause.*—This disease in rabbits is caused by protozoan parasites of the genus *Eimeria.* Although 5 different species of these organisms have been identified in rabbits, only 2 are of pathogenic significance. They occur in the intestine and in its mucous membrane lining, as well as in the liver, but the species in the intestine are distinct from those found in the liver. Although these minute parasites have no special organs of locomotion, they are rapidly spread to various parts of the digestive tract by the body movements of the animal and by intestinal activity. During the encysted stage the parasites are passed out in great numbers with the feces, contact with which thus becomes the usual means of spreading coccidiosis. When water and feed contaminated by these droppings are consumed, renewed infestations are produced. Probably one of the most common sources of infestation is by means of contaminated fur. Rabbits grooming themselves after lying on soiled floors or bedding and young animals nursing does that have had their underparts contaminated in unsanitary hutches are frequent victims of acute coccidiosis.

*Symptoms.*—Coccidial infestation affects rabbits in varying degrees, ranging from a slight attack, with no symptoms, to severely acute at-

tacks that terminate in death. Young animals adjusting their feeding habits after weaning appear to be the most susceptible to the ravages of the disease. Loss of appetite, diarrhea, "pot belly," and rough, unkempt fur are evidences of coccidiosis. In the most severe cases the droppings may be streaked with blood owing to severe inflammation of the lining of the intestine.

In the form of coccidiosis that involves the liver, that organ becomes hard to the touch and somewhat enlarged, and is gray-spotted or mottled in color over part or all of it. In intestinal coccidiosis there is an excess of mucus, and large areas of the lining of the intestine, sometimes for almost its entire length, are inflamed and of an intense red. Animals dying from severe intestinal coccidiosis generally have an empty stomach because of loss of appetite. Those affected with liver coccidiosis may continue to eat until shortly before death.

*Prevention and control.*—Losses from coccidiosis are much smaller in rabbitries where a good type of self-cleaning hutch is used. Floors composed of $\frac{5}{8}$-inch hardware cloth or perforated sheet iron allow waste products to fall through, and thus the likelihood of contamination is reduced. Under certain conditions such hutch floors may require occasional scrubbing to remove adherent particles of waste, but they are definitely superior to solid floors, even when provided with bedding. The parasitic organisms in the stage that is passed in the droppings are highly resistant to ordinary disinfectants and are difficult to eliminate from wooden or earthen-floored hutches. These sanitary and self-cleaning hutches are also recommended as aids in controlling parasitic diseases other than coccidiosis.

*Treatment.*—Parasitic organisms in the intestinal and liver tissue cannot be reached with any effective medication. A great many drugs have been experimented with for the purpose of curing coccidiosis. Some of these may serve as a stimulant or tonic and give the temporary impression of being a valuable remedy. In cases where the disease is accompanied by diarrhea, the use of astringents may give temporary relief, but no satisfactory cure is known.

Since it is extremely difficult entirely to eliminate the disease from a rabbitry, it is recommended that self-cleaning hutches and other sanitary practices be adopted to keep the disease under control.

### WORM INFESTATION

Domestic rabbits, because of the way in which they are housed and cared for, are not exposed to the great variety of worm parasites that frequently infest wild rabbits. A few species of worms do occur in domestic rabbitries, but their presence is usually the result of faulty sanitation.

### TAPEWORMS

The larval stages of certain tapeworms occur in various parts of the body of domestic rabbits. Adults of these worms are found in dogs and other carnivorous animals. The eggs pass from the infested carnivore with the feces. When feed that has been soiled by an infested dog is eaten by a rabbit, tapeworm cysts (fig. 4) will develop. Some of these cysts may be situated just beneath the skin and appear as large, soft rounded masses. They consist of a number of small cysts or membranous compartments filled with a clear fluid and containing the tapeworm heads. This tapeworm is known scientifically as *Multiceps serialis*. Tapeworm cysts may be found within the body cavity and attached to the visceral organs. These are about the size of a pea and are the larvae of *Taenia pisiformis* of the dog.

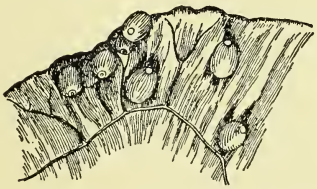

***Figure 4.*—Larval stage of *Taenia pisiformis* in the mesentery of rabbit. (Approximately natural size.) (From Railliet, 1895.)**

Adult tapeworms occurring in the intestines of domestic rabbits are very rare. The species parasitizing these animals seldom produce noticeable injury. If tapeworms are numerous, unthriftiness is noted. No treatment of value has been discovered for the removal of these parasites from rabbits.

### STOMACH WORMS

Although rabbits may be parasitized by various species of roundworms, the number affecting them is rather limited.

Stomach worms (*Obeliscoides cuniculi*) are pink or red and about ½ inch in length. Occasionally, when they become numerous, they produce unthriftiness in the animal, with progressive anemia and diarrhea. On autopsy the mucous membrane of the stomach lining may show considerable injury, owing to irritation by the worms. There may be extensive destruction of tissue, causing the affected organ to appear ulcerated.

*Prevention and control.*—As these worms produce eggs that pass out with the feces and have the opportunity to complete their life cycle when the rabbits eat feed contaminated with the larvae developing from these eggs, prevention consists of eliminating the possi-

bility of contamination. Stomach worms are rarely found in stock maintained in self-cleaning hutches. The unsanitary conditions likely to result from earthen-floored pens are the most common sources of trouble.

*Treatment.*—Treatment of affected animals with tetrachlorethylene, at a dose rate of ¼ cubic centimeter per pound of body weight, is recommended. Care should be taken to prevent the rabbit from inhaling the drug. Unless the attendant is thoroughly familiar with the technique of dosing with a stomach tube or capsules, a veterinarian should be employed.

### PINWORMS

Domestic rabbits are frequently infested with pinworms—small white worms about ½ inch long. These pinworms (*Passalurus ambiguus*) inhabit the posterior intestine, and cause local irritation and rubbing of the fur about the anus. The life cycle of this worm is direct, the rabbits becoming infested through eating food contaminated by feces containing the eggs of the parasite.

*Prevention and control.*—Isolation of affected animals and the prevention of contamination are the only means of controlling pinworms. Prompt disposal of the waste from affected rabbits is urged in order that the infective eggs may not reach healthy animals. The preferred drug for the removal of pinworms from rabbits is oil of chenopodium, administered at the dose rate of 0.15 cubic centimeter for each 2 pounds of body weight. This drug should be followed immediately by 10 to 15 cubic centimeters of castor oil. Withholding feed for a day prior to treatment aids in the efficacy of the drug.

### OTHER ROUNDWORM PARASITES

Parasitic roundworms have been reported from the lungs and intestines of domestic rabbits, but in well-managed, sanitary rabbitries they are of little importance. Sanitation is as essential in preventing parasitic infestation as it is in reducing losses from infectious diseases. In carrying out sanitary practices in a rabbitry the attendant should exercise extreme care to see that all possible contacts are eliminated; that the litter is removed promptly from the hutches; and that the utensils used in feeding and watering the animals are kept clean.

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